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(54) **Method and apparatus for recovering parity protected data.**

(57) A storage management mechanism resident on a storage controller (103) maintains parity records on the storage units (121-124) it services. The storage management mechanism includes a status map (106) indicating, for each data block (131-138), the location of the corresponding parity block (131,136), and the status of the data block. If a single storage unit fails, the system continues to operate, and the storage management mechanism is placed in a failure operating mode. While in failure operating mode, the storage management mechanism checks the status map before accessing data on the failed storage unit. If the data has not yet been reconstructed, storage management first reconstructs the data in that block of storage by successively reading and accumulating an Exclusive-OR (108) of the same blocks on all storage units in the parity group, including the parity block. The block of reconstructed data is stored in the location of the parity block, and the status map is updated to indicate that the block has been reconstructed. Once the data has been reconstructed, it is only necessary to read from or write to the former parity block directly. In the same manner, storage management will reconstruct a block of storage on the failed unit before writing to any corresponding block on a non-failed unit, if the block has not yet been reconstructed. In an alternate embodiment, spare areas of storage in the non-failing storage units are allocated to the reconstructed data. The total of these spare areas constitute a virtual spare storage unit. As data is reconstructed, it is placed in the virtual spare unit, and parity is maintained in the normal fashion.

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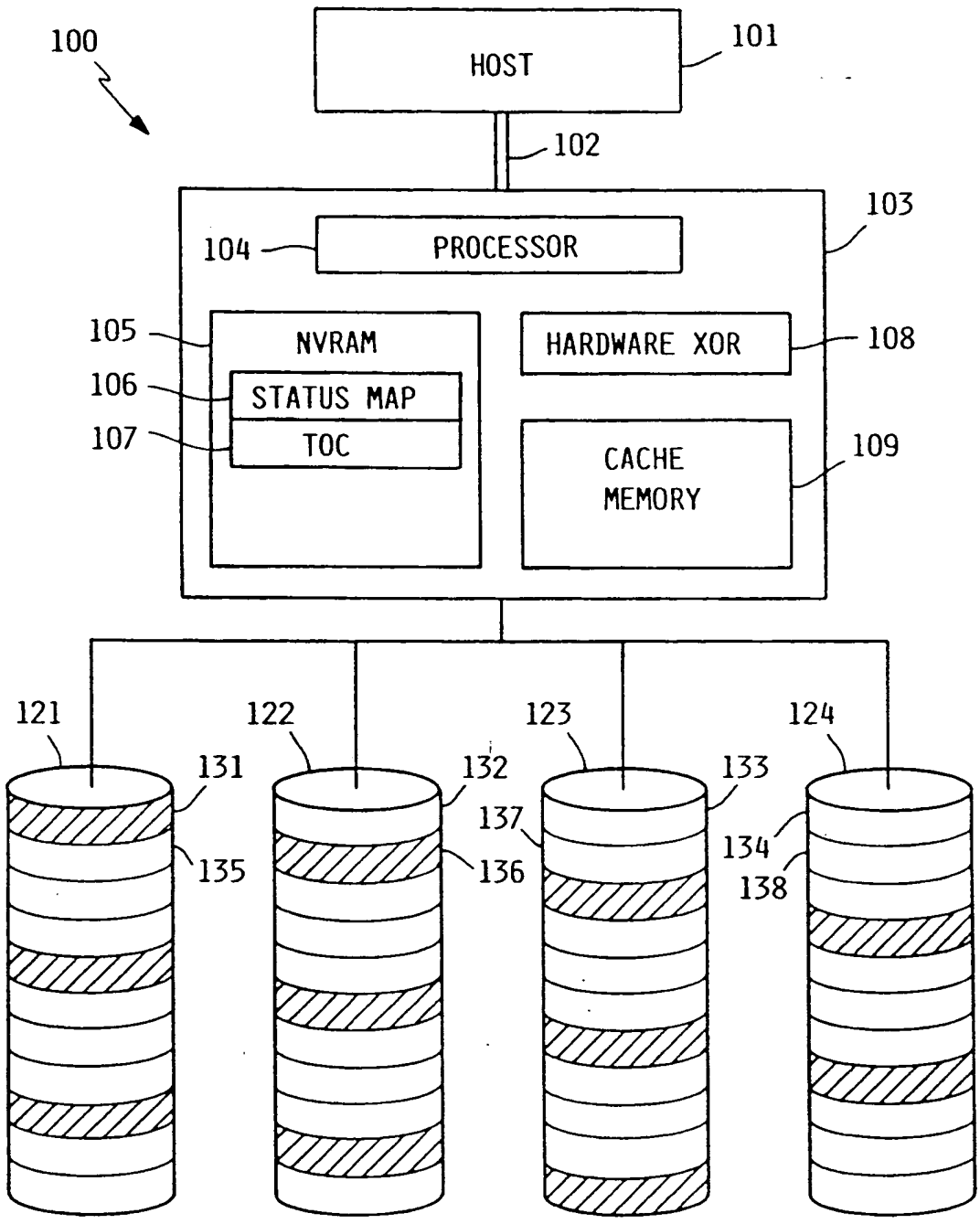

FIG. 1

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EUROPEAN SEARCH REPORT

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EP 91 48 0082

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	Computer Architecture News vol. 17, no. 5, September 1989, New York, USA pages 24 - 31; R. H. Katz et al.: "A project on high performance I/O subsystems" * the whole document *	1, 2, 5, 6, 9-11	G06F11/10
Y D,Y	EP-A-0249091 (IBM) * the whole document * & US-A-4761785	1, 2, 5, 6, 9-11	
E	BYTE. vol. 15, no. 13, December 1990, ST PETERBOROUGH US pages 337 - 339; M. H. Anderson: "Strength [and safety] in numbers" * the whole document *	1-11	
A	EP-A-0156724 (CII HONEYWELL BULL) * the whole document *	1-11	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			G06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	19 NOVEMBER 1991	DURAND, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application